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II. *A Proposal to bring small passable Stones soon and with Ease out of the Bladder : By the Reverend Stephen Hales, D. D.*

Read Octob. 31.
1746. here printed
with Alterations.

BEING present, *February 4. 1744-5.* when the late Right Honourable the Earl of *Orford* (after having taken for two Months *Dr. Furin's Lixivium*) voided at once eleven pretty large nearly cubical Fragments of larger Stones, which were involved in coagulated Blood and Urine; and, a few Hours after, fifteen more at once, in the same manner; in all thirty two that Day; some of which were as large as were possibly passable; it hence immediately occurred to my Thoughts, that all passable Stones which have lately fallen from the Kidneys into the Bladder, or which have broken off from larger ones, might readily and easily be brought out thence, by conveying into the empty Bladder, by a *Catheter*, some very mucilaginous Substance, such as Syrup of Marsh-mallows, or a Solution of Gum Arabic, or Barley-water. Such Substances would bring the Stones away soon, and with great Ease to the Patient; and thereby not only prevent much teasing Pain, by fruitlessly endeavouring to bring them away with the weak Force of thin Urine, but also effectually to secure the Patient from the Danger of their growing too big to come away, by long continuing in the Bladder.

And what strongly evinces the Reasonableness of this Proposal, is, that, on opening the Bladder of his Lordship, there were no Stones found remaining,
except

except two small Grains, which were involved in the Folds in the Neck of the Bladder.

If, on Trial, any Stones shall be found too big to pass off, the Patient is but where he was before; and if any shall be of such a Size as to enter the *Urethra* but Part of the Way, they may be pushed back, or cut out, according as their Situation shall happen to be.

And further to evince the Reasonableness of this Proposal, I made the following Experiments; *viz.* In order to shew the comparative Force, with which Fluids of different Degrees of Density and Tenacity will impel Stones, I took a glass Tube, which was an Inch in Diameter within, and fourteen and half Inches deep; and, having fill'd it full of Urine, I put into it a nearly cubical Piece of a large Stone, taken out of a human Bladder, which weigh'd seven and half Grains; and, standing by a Clock whose *Pendulum* beat Seconds, I found, by repeated Trials, that the Stone was a Second and a Quarter in descending through the fourteen and half Inches Depth of Urine.

The Experiment being tried with the same Stone in Oil of Olives, it was five and three Quarters Seconds in descending: So that the Resistance of the Oil to the falling Stone was 4.6, that is, more than four times greater than the Resistance of the Urine; and, consequently, the impelling Force of Oil to propel a Stone in passing thro' a narrow Tube, would be proportionably so much greater than that of Urine, were their Velocities equal.

When an Ounce of Gum-Arabic was dissolved in half a Pint of Water, the Stone descended in
two

two Seconds; with two Ounces, in three Seconds; with three Ounces, in four Seconds.

In a Decoction of warm Barley-water, which was so thick as to be a tender Jelly when cold, the Stone was forty-five Seconds in descending, that is, thirty-five times slower than in Urine; and, consequently, the impelling Force of Urine is thirty-five times less than that of this Mucilage, in case their Velocities were equal.

This Mucilage was, as I guess, of a due Consistence for the Purpose; for it was about the Thickness of Lord Orford's coagulated Blood and Urine. Equal Quantities of Blood and Urine will continue a thick *Coagulum* for many Weeks, without any Separation.

But as the Velocity, with which such mucilaginous Substances pass thro' small Tubes, is considerably less than the Velocity with which Urine will pass; supposing the Forces with which they are impelled to be equal; it was requisite to determine those different Velocities by Experiments: And, in order to it, I put half a Pint of the same blood-warm Decoction of Barley into a glass Vessel, where its Depth was near eight Inches, and therefore its mean Depth near four Inches. It run out at the Bottom in about fifty Seconds thro' a glass Tube, whose Bore was $\frac{1}{7}$ th Inch Diameter; its Length two Inches: And, on repeating the same Experiment twice, as the Decoction grew cooler and cooler, it was about eighty and then ninety Seconds in running out; whereas a like Quantity of Urine ran out thro' the same Tube in eighteen Seconds.

Now, supposing the Velocities, at a *Medium*, thro' the *Urethra*, to be as seventy-two to eighteen, then the Velocity of the Urine will be three Fourths greater

greater than that of the Mucilage of Barley. Taking therefore three Fourths from Thirty-six, the Force of the Mucilage, the Remainder nine is the Force with which the Mucilage will impel the Stone ; and, consequently, the impelling Force of the Mucilage, in the Neck of the Bladder and in the *Urethra*, will be nine times greater than that of Urine ; besides the Advantage of greater Slipperiness which it gives to the *Urethra*.

III. *An Account of some Experiments, lately made in Holland, upon the Fragility of unannealed glass Vessels ; communicated to the President.*

Read Oct. 3^d.
1745.

THE following Paper contains the Account of several Experiments of an odd Nature, that have lately been tried both in *Italy* and in *Holland*, upon some unannealed glass Phials ; that is to say, such as have been exposed to the Air as soon as blown, without passing through the Operation that is commonly called **Annealing**.

The excessive Fragility of these Sorts of Glasses must have been observed, as long as the Art of making Glass has been in Use : it having been found, that almost all the Vessels that were made of such Glass were entirely useless upon that Account ; as being subject to break and fly, almost constantly, of themselves, and that even frequently before they were well cold.

It was therefore to remedy this Inconveniency that the Practice of Nealing or Annealing them was de-